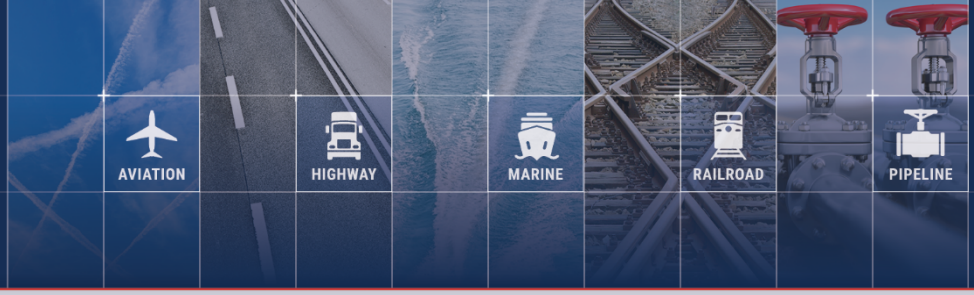

Aviation Investigation Final Report

Location:	Page, Arizona	**Accident Number:**	WPR21FA352
Date & Time:	September 22, 2021, 16:24 Local	**Registration:**	N3906X
Aircraft:	Piper PA-28R-200	**Aircraft Damage:**	Substantial
Defining Event:	Fuel exhaustion	**Injuries:**	1 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot and the passenger (the pilot's wife) were making their first cross-country flight in their private airplane. After loading the airplane with several items, including a boat motor, camping gear, a raft, and two dogs, the pilot completed the airplane's weight and balance calculations, and the airplane departed. The climb and cruise portions of the flight were uneventful. About 3 hours 15 minutes into the flight, the pilot began to descend the airplane to an altitude of about 7,700 ft mean sea level (msl) and, about 12 minutes before the accident, descended the airplane to about 6,600 ft msl. The passenger stated that the pilot became upset a few minutes before the accident, and the airplane began to descend about 1 minute before the accident until it impacted the ground.

The propeller blade signatures at the accident site were consistent with low rotational energy. Postaccident examination of the wreckage revealed no evidence of a preimpact mechanical malfunction or anomaly with the engine or airframe. The examination found no fuel in either fuel tank, neither of which was breached, and there was no evidence of a fuel odor or staining on the airframe.

Fuel performance computations suggested that the airplane likely lost power due to fuel exhaustion about 1 minute before the accident. These computations also suggested that the airplane departed with 42 gallons instead of the 48 gallons indicated in the pilot's operating handbook, likely to accommodate the weight of the cargo. Although the pilot had completed weight and balance calculations for the accident flight, no evidence indicated that he considered the airplane's performance. If the pilot had properly computed the airplane's fuel consumption for the planned flight, he should have recognized that the airplane had insufficient fuel to reach its destination. Instead, fuel exhaustion occurred, which led to a total loss of engine power. The airplane was also slightly over gross weight at the time of departure,

which likely didn't affect his forced landing as the airplane landed upright and the center of gravity was within published limitations.

Both occupants were wearing their three-point restraints, and they sustained serious traumatic injuries during the impact. Evidence showed that the heaviest portion of the boat motor had contacted the pilot's seat at the time of impact, which caused the seat to move forward during impact and compress the pilot between the seatback and forward control panel. This loss of occupiable space likely contributed to the severity of his injuries.

Toxicology testing of the pilot's blood detected the presence of two sedating antihistamines. At the time of the pilot's death, one of the medications was likely at therapeutic levels, and the other was at subtherapeutic levels but was likely at therapeutic levels when the airplane departed. The medications can impair cognitive and psychomotor performance; however, the investigation could not determine, based on the available evidence, if the effects from the pilot's use of the medications contributed to the accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's improper fuel planning for a cross-country flight, which resulted in fuel exhaustion and a total loss of engine power.

Findings

Aircraft	Fuel - Fluid level
Personnel issues	Use of equip/system - Pilot
Personnel issues	Fuel planning - Pilot

Factual Information

History of Flight

Enroute-descent	Fuel exhaustion (Defining event)
Enroute-descent	Loss of engine power (total)
Emergency descent	Collision with terr/obj (non-CFIT)

On September 22, 2021, about 1624 mountain standard time, a Piper PA-28R-200, N3906X, was substantially damaged when it was involved in an accident near Page Municipal Airport (PGA), Page, Arizona. The pilot sustained fatal injuries, and the passenger sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

Automatic dependent surveillance-broadcast (ADS-B) track data from the Federal Aviation Administration captured the airplane's climbout from San Martin, California, about 1211 Pacific daylight time. About 1615, the airplane was 30 nautical miles (nm) west of PGA and at an altitude of about 7,250 ft msl (1,100 ft above ground level [agl]). About 1623, the airplane descended to about 6,600 ft msl (500 ft agl), where it remained until 1623:46, when it began its final descent. The final ADS-B data point, at 1624:15, showed that the airplane was at 200 ft agl and about 0.5 nm northwest of the accident site. The airplane continued to descend and impacted the ground. According to the ADS-B track data, the total distance of the accident flight was about 620 statute miles. The passenger (the pilot's wife) recounted that most of the flight was uneventful but that, a few minutes before the accident, the pilot became visibly upset and began pushing buttons.

Pilot Information

Certificate:	Private	**Age:**	57,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	October 26, 2020
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	August 25, 2021
Flight Time:	447.3 hours (Total, all aircraft), 377 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N3906X
Model/Series:	PA-28R-200	**Aircraft Category:**	Airplane
Year of Manufacture:	1975	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	28R-7535348
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	November 3, 2020 Annual	**Certified Max Gross Wt.:**	2650 lbs
Time Since Last Inspection:	38 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	7404 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-360-C1C
Registered Owner:	On file	**Rated Power:**	180 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KPGA,4310 ft msl	**Distance from Accident Site:**	12 Nautical Miles
Observation Time:	16:53 Local	**Direction from Accident Site:**	84°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	20°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.13 inches Hg	**Temperature/Dew Point:**	30°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	San Martin, CA (E16)	**Type of Flight Plan Filed:**	None
Destination:	Page, AZ (PGA)	**Type of Clearance:**	VFR flight following
Departure Time:	12:11 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	PAGE MUNI PGA	**Runway Surface Type:**	
Airport Elevation:	4316 ft msl	**Runway Surface Condition:**	Dry
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious	**Latitude, Longitude:**	36.905783,-111.68978

The airplane was located about 11 nm west of PGA on a mesa at a field elevation of about 6,150 ft msl. The airplane came to rest at a level attitude on a magnetic heading of 227°, as shown in the figure below.

Figure. Accident site.

The first point of impact was identified by a 12-foot-tall tree with several broken branches. A debris path was marked by parallel ground scars that began about 20 ft forward of the first point of impact and was oriented on a magnetic heading of 155°. The outboard right stabilator was located on the left side of the debris path.

During a postaccident examination, continuity of the ailerons, stabilator, and rudder were confirmed from the cockpit to their respective control surfaces.

Mechanical continuity of the engine was established throughout the rotating group, valve train, and accessory section when the crankshaft was manually rotated at the propeller. Thumb compression was achieved at all four cylinders, and the valves displayed normal lift. Borescope examination of the cylinder's combustion chamber interior components revealed normal piston face and valve signatures and no indications of catastrophic engine failure.

The three-bladed constant-speed propeller remained attached at the crankshaft flange. All three blades remained attached to the hub. One blade was bent aft at the blade root, another was bent aft at the blade tip, and the other blade was straight. None of the propeller blades displayed any visible chordwise scratches, nicks, or gouges.

The right and left wing fuel tanks had no fuel and displayed no evidence of fuel staining. There was also no evidence of fuel staining on the ground around the wings or any fuel smell. The

fuel system exhibited no visible breaches, and all fuel system components functioned normally.

Medical and Pathological Information

The Medical Examiner's Office of Coconino County, Flagstaff, Arizona, performed an autopsy on the pilot. His cause of death was multiple blunt force injuries. The autopsy report stated that the pilot sustained serious injuries to both his head and torso. The report noted the presence of a right orbital roof/frontal bone fracture and right-sided subarachnoid hemorrhage. Additionally, the pilot sustained open and closed bilateral rib fractures, a fracture of the sternum, scattered pulmonary contusions, and a fracture of the lumbar vertebral column.

The passenger's serious injuries included a fractured left clavicle, fractured right ribs, nasal fractures, pulmonary contusions, a lumbar compression fracture, and a large open laceration of the right knee. She was hospitalized for 6 days.

Toxicology testing performed by the Federal Aviation Administration (FAA) Forensic Sciences Laboratory identified the diphenhydramine at 70 ng/mL in the pilot's cavity blood and urine and the cetirizine at 109 ng/mL in the pilot's cavity blood and 7,607 ng/mL in his urine.

Diphenhydramine is a sedating antihistamine (commonly marketed as Benadryl) and is available over the counter in several products used to treat colds, allergies, and insomnia. The medication carries the warning that use of the medication may impair mental and physical ability to perform potentially hazardous tasks, including driving or operating heavy machinery. The therapeutic range is 25 to 100 ng/mL and it has a half-life of 3 to 14 hours. Diphenhydramine undergoes postmortem distribution, and central levels may be two to three times higher than peripheral levels. The FAA provides guidance on wait times for flying after using this medication; the post-dose observation time is listed as 60 hours, and the medication is "not for daily use."

Cetirizine is a second-generation antihistamine used to relieve hay fever and allergy symptoms (commonly marketed as Zyrtec). The therapeutic range is between 190 and 1,450 ng/mL and the elimination half-life is between 6.5 and 10 hours. The FAA guidance on Cetirizine includes a post-dose observation time of 48 hours and an indication that the medication is not for daily use.

Survival Aspects

The autopsy report, on -scene photographs, and other documentation were used to review the survival aspects of this flight. Postaccident photographs showed that the pilot was pinned between the seatback and the forward control panel in a compressed “knees-to-chest” position. The photographs also showed an unrestrained 80-pound outboard boat motor in the airplane cabin behind the front left (pilot’s) seat; the heaviest portion of the motor contacted the back of the front left seat.

The airplane was equipped with three-point restraints at both forward seating positions. The passenger reported being restrained during impact, and the pilot’s shoulder harness had a linear separation that was consistent with cutting by emergency response personnel. Both ceiling-mounted inertia reels were found in place, and the lap-belt portions of both restraints were still attached to the floor fittings and were undamaged.

The passenger stated that all the items in the back of the airplane were secured with rope. The onsite investigation found that the items were not secured, and rope was not located.

Additional Information

Passenger Interview

The passenger reported that she heard the engine “smoothly running” and producing a “humming” sound after the airplane impacted the ground. She could not recall if the propeller was moving. The passenger also reported that the sound ceased about 30 seconds after impact.

During a telephone interview, the NTSB played three different audio files (from similar make/model airplanes) for the passenger. Those files comprised (1) audio of an engine at idle power, (2) audio of only the master switch engaged and the vacuum pump in the background, and (3) audio of an engine at run-up power. The audio files were played twice, and both times

the passenger identified the audio of the master switch and vacuum pump as the sound that she heard after impact.

Performance Computations

According to the ADS-B track data, the total distance of the accident flight was about 620 statute miles. During this time, the airplane was in a climb for the first 50 minutes of flight, cruise flight at an altitude of about 12,000 ft msl for about 80 minutes, a descent to about 7,700 ft msl for about 8 minutes, and cruise flight at about same altitude (within 1,000 ft) for about 54 minutes before the airplane descended again and crashed.

The airplane's fuel consumption and performance were computed using the pilot's operating handbook (POH). Calculations from the "Cruise Performance – Range" chart in the POH showed that the airplane had an estimated endurance of about 800 statute miles with the following conditions: 65% throttle, 48 gallons of fuel onboard, and the airplane's published maximum gross weight of 2,650 pounds. The calculations also assumed the entire flight was flown at 12,000 ft msl; at 7,700 ft msl, the airplane's endurance was about 750 statute miles. The handbook did not include any performance aids to compute an airplane's fuel consumption during climb and descent.

The airplane's weight and balance was calculated using an empty airplane weight from the website of a flying club to which the pilot belonged and a fuel weight derived from a weight record that the pilot created before the accident flight. The weight record included an itemized list of the luggage items onboard, which had a total calculated weight of 363 pounds. The cargo aboard the airplane included a boat motor, camping gear, a raft, bags, and the pilot's two dogs. The autopsy showed that the pilot's weight was 168 pounds at the time of his death, and the passenger (the pilot's wife) stated that her weight was about 152 pounds.

One additional number was found on the pilot's weight record document: 256. For the calculations, the "256" number was assumed to be the fuel onboard at the time of takeoff; when 256 was divided by the fuel weight of 100 low lead aviation grade gasoline, the result was about 42 gallons. The passenger thought that the pilot had not completely filled the tanks. With an empty airplane weight of 1,710 pounds, an assumed fuel weight of 256 pounds, and an oil weight of 15 pounds, and the weight of cargo and occupants, the airplane's total weight would have been 2,664 pounds at the time of departure.

The airplane's center of gravity (CG) at the time of departure was 89 inches behind the datum plane. According to the CG chart in the POH, the airplane's weight at the time of departure was outside the weight envelope while the CG was within the published tolerance.

The published fuel consumption at 65% throttle was 9.16 gallons per hour. Computations showed that the airplane would have had an endurance of about 4 hours 24 minutes with 42 gallons of fuel onboard. The total flight time was 4 hours 12 minutes.

The handbook also contained a “WARNING” message that stated the following: “Performance information derived by extrapolation beyond the limits shown on the charts should not be used for flight planning purposes.”

Administrative Information

Investigator In Charge (IIC):	Stein, Stephen
Additional Participating Persons:	John Waugh; Federal Aviation Administration; Las Vegas, NV Mark Platt; Lycoming Engines; Williamsport, PA Kathryn Whitaker; Piper Aircraft Company; Vero Beach, FL
Original Publish Date:	April 19, 2023
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=103948